

**10 Cooling Curve Lab (1700972)**

Question

**1** 2 3**Instructions**

Materials: Temperature probe, #3 one holed stopper, insulated cup, extra-large test tube, tap water, graduated cylinder, 2-methyl-2-propanol, graph paper, hot water bath, ice, test tube holder, pneumatic trough.

Objective: To observe the cooling behavior and to determine the freezing point of 2-methyl-2-propanol.

Procedure:

Set up the probe: Plug the temperature probe into a USB port on the keyboard of the computer.

Insert the probe into the one holed stopper.

Locate and open the program: Logger Lite.

Click on the "Experiment" menu and choose "Data collection".

Enter 1500 in the "Duration (or Length)" box.

Enter 30 in the "seconds/sample box" (on the right).

(The left box should say .03333 samples/second.)

Click "Done"

1. Set up an ice bath in an insulated cup filled with ice and enough tap water to make the cup about 80% full. Set the cup in an empty pneumatic trough to catch any overflow water or ice.
2. Measure out about 30 mL of 2-methyl-2-propanol with a graduated cylinder and place it into an extra-large test tube. Place the temperature probe carefully into the test tube so that it is stable and the probe is in the middle of the tube.
3. Place the test tube of 2-methyl-2-propanol into the ice bath and click the green "Collect" button. Try to keep the probe in the middle of the test tube.
4. Stir the ice bath occasionally by moving the test tube gently around. Try to keep the probe in the middle of the test tube. Add more ice to the ice bath.
5. Keep taking readings until a temperature of 15.0° C is reached.
6. Copy the data table into your notes.
7. Create a paper graph of your data. Be sure to include a title and labels with units.

When finished, take a photo of the graph and upload it to Webassign. Turn in your graph also.

To clean up: Place a test tube holder on the test tube and set it in the hot water bath and allow the 2-methyl-2-propanol to melt. Remove the probe and pour the liquid 2-methyl-2-propanol back into the original container since it can be reused. Wipe off the probe and return it to the box. Do not clean or rinse the test tube. (The remaining alcohol will evaporate from inside the test tube.)

## 1. Question Details

Freezing Lab Data [1711660]

Heat of fusion of 2-methyl-2-propanol,  $H_f = 21.88 \text{ cal/g}$   
Specific heat of solid 2-methyl-2-propanol,  $c(s) = 0.299 \text{ cal/g}^\circ\text{C}$   
Specific heat of liquid 2-methyl-2-propanol,  $c(l) = 0.243 \text{ cal/g}^\circ\text{C}$

a. Enter the melting/freezing point for 2-methyl-2-propanol (from your experiment):

4.0 ✓  °C

Submit question a. before proceeding. The answer to question a. must be correct before the other questions can be properly evaluated.

b. Calculate the heat needed to change the temperature of 16.100 g of 2-methyl-2-propanol from 10.0 °C to 17.0 °C

4.0 ✓  cal

c. Calculate the heat needed to melt 16.100 g of 2-methyl-2-propanol

4.0 ✓  cal

d. What mass of ice could be melted with the heat from question c?

4.0 ✓  g

(heat of fusion of ice = 80.0 cal/g)

e. How much heat would be released in cooling 16.100 g 2-methyl-2-propanol from 50.0 °C to 15.0 °C?

4.0 ✓  cal

## 2. Question Details

Cooling Curve Graph [1711451]

Take a photo of your paper graph and upload it here:  no file selected

## 3. Question Details

Cooling Lab Describe Graph [1712211]

Describe your graph. (explain the shape; why is it this shape?)

## Assignment Details

Name (AID): 10 Cooling Curve Lab (1700972)

Submissions Allowed: 5

Category: Homework

Code:

Locked: Yes

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